DOCUMENTATION OF THE DECISION MAKING AND ANALYSIS PROCESS THAT LED TO APPROVAL OF INFRASTRUCTURE CONDITION, SYSTEM PERFORMANCE, FREIGHT MOVEMENT, AND CONGESTION MITIGATION AND AIR QUALITY (CMAQ) PROGRAM EMISSION REDUCTION PERFORMANCE MEASURE TARGETS FOR THE SHEBOYGAN METROPOLITAN PLANNING AREA

The purpose of this document has been to provide context and assist in determining whether the Sheboygan MPO should establish its own transportation performance targets for the above measures based on new federal regulations, or support statewide targets in these areas.

PAVEMENT AND BRIDGE CONDITIONS

Pursuant to federal regulations, the Wisconsin Department of Transportation (WisDOT) has established statewide targets based on federal performance measures intended to assess pavement and bridge conditions on the National Highway System (NHS). The National Performance Management Measures **Second Performance Rule** (PM2) includes a Federal Highway Administration (FHWA) pavement condition rating system that allows national comparisons of NHS conditions, using data that all states can reasonably collect.

WisDOT notes that the pavement rating system used in this analysis is a simplified measure capable of providing only a rudimentary assessment of pavement conditions. WisDOT cautions that these newly created measures do not precisely correlate with more comprehensive methods of assessing pavement conditions on state highways.

The NHS in the Sheboygan Metropolitan Planning Area (MPA) includes all of Interstate 43 and State Highway 23 in the MPA, as well as portions of State Highways 28, 32 and 42 in the MPA.

Metrics

A comprehensive table of pavement conditions in the Sheboygan MPA for 2016 was provided by WisDOT. Pursuant to recommendations from the FHWA, the following section data were excluded: pavement conditions on bridge structures (bridge data is analyzed separately); missing, invalid, or unresolved data; and pavement sections where surface type was “unpaved” or “other.” The remaining Interstate and non-Interstate NHS pavement sections were separated, then classified based on their performance on each metric.

Four metrics are used to evaluate pavement conditions under PM2, including: the International Roughness Index (**IRI**, measured in inches per mile); average **rutting** (measured in inches); **faulting**, or the average vertical displacement (in inches) between adjacent jointed concrete panels; and fatigue **cracking** (measured as a percentage). Figure 1 shows pavement condition thresholds for each metric.

Figure 1: Pavement Condition Thresholds

	Good	Fair	Poor
IRI (inches/mile)	<95	95-170	>170
Rutting (inches)	<0.20	0.20-0.40	>0.40
Faulting (inches)	<0.10	0.10-0.15	>0.15
Cracking (%)	<5	5-20 (asphalt) 5-15 (JCP) 5-10 (CRCP)	>20 (asphalt) >15 (JCP) >10 (CRCP)

Source: U.S. Department of Transportation Federal Highway Administration, 2018.

A pavement section was classified as "good" if **all** pertinent metrics fell into the "good" range. If two (2) or more metrics fell into the "poor" range, the section was classified as "poor." A section with any other combination of metrics was classified as "fair."

Bridges in the Sheboygan MPA NHS were evaluated separately from pavements, using different condition measures. A bridge's deck, superstructure, substructure, and culvert are graded using the National Bridge Inventory (NBI) condition rating scale from 0 (failed condition) to 9 (excellent condition). A structure is considered "good" if the lowest NBI value is 7 or greater. A structure is "fair" if the lowest NBI value is 5 or 6. A structure is in "poor" condition if the lowest NBI value is 4 or less.

Findings

Table 1 shows 2016 NHS pavement conditions in the Sheboygan MPA compared to WisDOT's statewide targets for 2019 and 2021. Interstate system pavements measured in 2016 in the Sheboygan MPA achieved WisDOT's four-year (2021) targets for pavements in "good" and "poor" condition; 93 percent of pavements were in good condition, substantially exceeding the state's low-end target of 45 percent, and there were no Interstate pavement sections that fell in the "poor" category, thus achieving the state's four-year target of no more than 5 percent. Non-Interstate NHS pavements measured in 2016 in the Sheboygan MPA achieve WisDOT's two- and four-year targets for "good" and "poor" pavement percentages: nearly 36 percent of pavements were in "good" condition, achieving the state target of no less than 20 percent, and the percentage of pavements in "poor" condition (2 percent) achieves the target of no more than 12 percent. Two-year (2019) statewide targets for the Interstate system were not required by the FHWA.

Table 1: NHS Pavement Conditions in the Sheboygan MPA Compared to Statewide Targets

Measure	*2016 Results (Sheboygan MPA)*	*2-Year Target (2019)*	*4-Year Target (2021)*
Interstate - Percentage pavements in "Good" Condition	93.4%	N/A	≥ 45%
Interstate - Percentage pavements in "Poor" Condition	0.0%	N/A	≤ 5%
Non-Interstate NHS - Percentage pavements in "Good" Condition	35.8%	≥ 20%	≥ 20%
Non-Interstate NHS - Percentage pavements in "Poor" Condition	1.8%	≤ 12%	≤ 12%

Source: Wisconsin Department of Transportation, 2018; and Bay-Lake Regional Planning Commission, 2018.

Table 2 shows the percentage of NHS bridges by deck area in the Sheboygan MPA that were in "good" and "poor" condition, compared to WisDOT's two- and four-year targets. NHS bridges in the MPA **did not** achieve WisDOT's two- and four- year targets for bridges in "good" condition; nearly 29 percent of bridges were in "good" condition, falling short of the state's target of 50 percent or greater. There were no bridges in "poor" condition, thus achieving the state's target of 3 percent or less.

Table 2: NHS Bridge Conditions in the Sheboygan MPA Compared to Statewide Targets

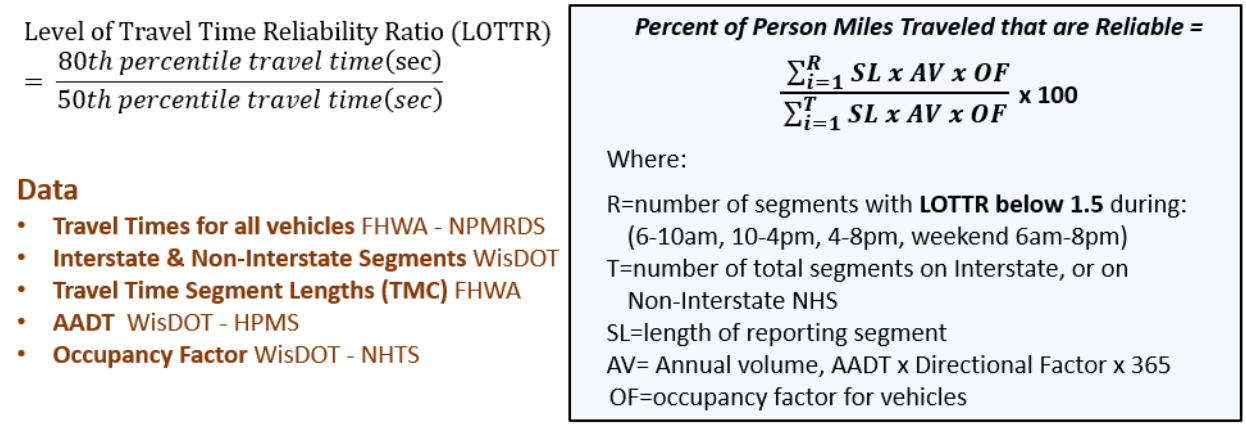
Measure	*2016 Results (Sheboygan MPA)*	*2-Year Target (2019)*	*4-Year Target (2021)*
Percentage of NHS bridges by deck area in "Good" condition	28.9%	≥ 50%	≥ 50%
Percentage of NHS bridges by deck area in "Poor" condition	0.0%	≤ 3%	≤ 3%

Source: Wisconsin Department of Transportation, 2018; and Bay-Lake Regional Planning Commission, 2018.

TRAVEL TIME RELIABILITY

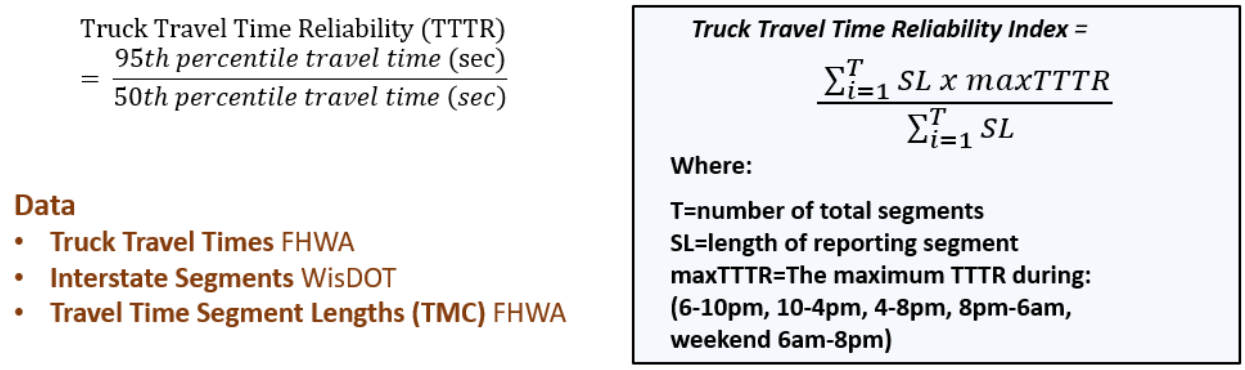
Pursuant to federal regulations, WisDOT has established statewide targets based on federal performance measures intended to assess the freight and travel time reliability on the National Highway System (NHS). The National Performance Management Measures **Third Performance Rule** (PM3) includes two reliability metrics that are relevant to the Sheboygan MPA: level of travel time reliability (LOTTR); and truck travel time reliability (TTTR). Both LOTTR and TTTR are ratios that reflect the difference between longer travel times and "average" travel times that take place on NHS route sections. Figure 2 shows how LOTTR is used to calculate reliable person-miles as a percentage of total person-miles on the Interstate and non-Interstate NHS. Figure 3 shows how TTTR index is calculated.

Figure 2: Reliable Person-Miles Calculation Breakdown



Source: Wisconsin Department of Transportation, 2018.

Figure 3: Truck Travel Time Reliability Index Calculation Breakdown



Source: Wisconsin Department of Transportation, 2018.

WisDOT cautions the use of the performance metrics developed by the FHWA to make broad comparisons between states. For example, the 50th percentile travel time on an NHS section with recurring vehicle congestion in one urbanized area (UZA) would likely be well above another section in an UZA with minimal vehicle congestion. Under FHWA's metrics, it's possible that both sections would have the same reliability index. For these reasons, these measures should only be used to make comparisons in limited geographic areas, such as within an urbanized area.

Table 3 shows 2017 travel and freight reliability performance results for the NHS in the Sheboygan MPA, compared to WisDOT's 2019 and 2021 statewide targets. In 2017, 100 percent of person-miles traveled on the Interstate were reliable. Unsurprisingly this achieves the 2019 target (94.0 percent of person-miles) as well as the 2021 target (90.0 percent of person-miles). However, on the non-Interstate NHS, 83.6 percent of person miles traveled were reliable, falling short of the four-year (2021) target of 86.0 percent. A two-year target for non-Interstate NHS reliable person-miles was not required by the FHWA. In addition, the performance of the Interstate in the Sheboygan MPA achieved state targets for freight reliability: the TTTR index was 1.13, achieving the 2019 target of 1.40, as well as the 2021 target of 1.60.

Table 3: Travel and Freight Reliability in the Sheboygan MPA Compared to Statewide Targets

Measure	*2017 Results (Sheboygan MPA)*	*2-Year Target (2019)*	*4-Year Target (2021)*
Travel Reliability			
Percent of person-miles traveled that are reliable on the Interstate	100.0%	94.0%	90.0%
Percent of person-miles traveled that are reliable on Non-Interstate NHS	83.6%	N/A	86.0%
Freight Reliability			
Truck Travel Time Reliability Index on the Interstate	1.13	1.40	1.60

Source: Wisconsin Department of Transportation, 2018; and Bay-Lake Regional Planning Commission, 2018.

EMISSION REDUCTIONS

The Sheboygan MPO is responsible for either setting total emission reduction targets within the Sheboygan MPA (part of the Sheboygan County 2008 nonattainment area for ground-level ozone) or supporting statewide target for total emission reductions. Targets are based on all Congestion Mitigation and Air Quality (CMAQ) projects. The Sheboygan MPO must either establish its own targets or support WisDOT's statewide targets for three criteria pollutants: Volatile Organic Compounds (VOC), Nitrogen Oxides (NOx), and Particulate Matter 2.5 (PM2.5).

The two (2) year statewide targets are based on actual projected emission reduction derived from summing the anticipated benefits of scheduled projects. The four (4) year statewide targets are based on the anticipated benefits of projects scheduled for calendar years 2018 through 2021.

Projects to be programmed in calendar years 2020 and 2021 are anticipated to result in good emission reduction estimates (e.g. signalization projects with favorable reduction estimate calculations).

For a variety of reasons, the Sheboygan MPO intends to support WisDOT's statewide targets in the area of emission reductions. The CMAQ Public Access System does not have a particularly complete list of CMAQ projects for the metropolitan planning area, and there are no good ways to reasonably estimate emission reductions for CMAQ projects when the CMAQ Public Access System is so heavily relied upon for this purpose.

Table 4: Total Statewide Emission Reduction Estimates for CMAQ Projects

Target Recommendations:	**VOC**	**NOx**	**PM 2.5**
2 YEAR ***(2019)***	**12.154 kg.**	**90.354 kg.**	**9.043 kg.**
4 YEAR (2021)	**30.123 kg.**	**150.388 kg.**	**13.820 kg.**

Source: Wisconsin Department of Transportation, 2018; and Bay-Lake Regional Planning Commission, 2018.

CONCLUSION

Since most of the above noted performance measure statistics were better than statewide statistics, or since there were currently insufficient data to set MPO-specific targets, Bay-Lake Regional Planning Commission staff recommended supporting each of WisDOT's performance targets (as opposed to setting independent performance targets).

Approval of the Infrastructure Condition, System Performance, Freight Movement, and CMAQ Program Emission Reduction Performance Measure Targets for the Sheboygan Metropolitan Planning Area (and specifically supporting WisDOT's performance targets in these areas) was recommended by the Sheboygan MPO Technical and Policy Advisory Committees at their joint meeting on October 25, 2018. The MPO advisory committees also deliberated on this matter at joint meetings in late July and early September.

The Bay-Lake Regional Planning Commission, as MPO for the Sheboygan Metropolitan Planning Area, agrees to plan and program projects so that they contribute toward the accomplishment of WisDOT's Statewide Infrastructure Condition, System Performance, Freight Movement, and CMAQ Program Emission Reduction Performance Measure Targets, as noted in Table 5.

Table 5: WisDOT Statewide Infrastructure Condition, System Performance, Freight Movement, and CMAQ Program Emission Reduction Performance Measure Targets

Measure	2-Year Target (2019)	4-Year Target (2021)
Interstate - Percentage of pavements in "Good" condition	NA	≥45%
Interstate - Percentage of pavements in "Poor" condition	NA	≤5%
Non-Interstate NHS - Percentage of pavements in "Good" condition	≥20%	≥20%
Non-Interstate NHS - Percentage of pavements in "Poor" condition	≤12%	≤12%
Percentage of NHS bridges by deck area in "Good" condition	≥50%	≥50%
Percentage of NHS bridges by deck area in "Poor" condition	≤3%	≤3%
Percentage of person-miles traveled that are reliable on the Interstate	94.0%	90.0%
Percentage of person-miles traveled that are reliable on the Non-Interstate NHS	NA	86.0%
Truck Travel Time Reliability Index on the Interstate	1.40	1.60
Total Emission Reductions in nonattainment or maintenance areas for:		
VOC	12.154 kg.	30.123 kg.
NOx	90.354 kg.	150.388 kg.
PM 2.5	9.043 kg.	13.820 kg.

Source: Wisconsin Department of Transportation, 2018.